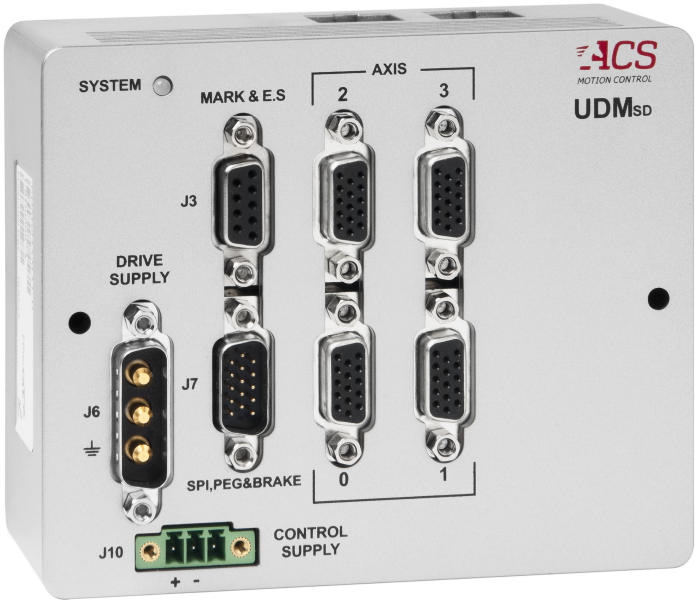

UDMSD

Installation Guide

August, 2016

Document Revision: 2.29.30

UDMSD

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Revision History

Date	Revision	Description
August 2016	2.29.30	Updated related documents.
May 2016	2.29.20	Updated available options for Accessory Kits Moved the following sections into "Feedback" section • Axis and Encoder Numbering and Assignments • Incremental Digital AqB Encoder • Absolute Encoder Support • Position Event Generation (PEG) for Axis 0
October 2015	2.29.10	Update to Table 8.1
August 2015	2.29.01	Updated all figures, removed support for 5/10A, changed control supply to 24V, from two to one SPI, and two total mechanical brakes.
March 2015	2.29	First Release

Conventions Used in this Guide

Text Formats

Format	Description
Bold	Names of GUI objects or commands.
BOLD+ UPPERCASE	ACSPL+ variables and commands
Monospace + grey background	Code example.
Italic	Names of other documents.
Blue	Web pages, and e-mail addresses.
[ ]	In commands indicates optional item(s)
|	In commands indicates either/or items

Flagged Text

	**NOTE** - includes additional information or programming tips.
	**CAUTION** - describes a condition that may result in damage to equipment.
	**WARNING** - describes a condition that may result in serious bodily injury or death.
	**MODEL** - highlights a specification, procedure, condition, or statement that depends on the product model.
	**ADVANCED** - indicates a topic for advanced users.

Related Documents

Documents listed in the following table provide additional information related to this document.

The most updated version of the documents can be downloaded by authorized users from www.acsmotioncontrol.com/downloads.

Document	Description
SPiiPlus Setup Guide	A guide providing step-by-step instructions for setting up a SPiiPlus system.
SPiiPlus MMI Application Studio User Guide	A complete guide for using the SPiiPlus MMI Application Studio.
SPiiPlus Utilities User Guide	A guide for using the SPiiPlus User Mode Driver (UMD) for setting up communication with the SPiiPlus motion controller.
PEG and MARK Operations Application Notes	Provides details on using the PEG commands in NT systems.

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1. Introduction

1.1 Document Scope

This document provides specification and operation information for the ACS Motion Control UDMSD.

1.2 Product Overview

The UDMSD is a two or four axes universal drive module. It is part of the ACS line of EtherCAT® network drives. The product is a small footprint and low price universal PWM network drive module. It functions as a slave of any ACS EtherCAT® master controller. It is either panel or DIN rail mounted.

The product supports a 12Vdc to 48Vdc drive supply. Control supply is 24Vdc±20%. It supports four axes with a current rating of 1.25/2.5A (cont/peak) or 2.5/5A.

The following types of motors are supported:

- Two- and three-phase AC synchronous (or DC brushless)
- DC brush
- Two- and three-phase step motors.

Incremental digital encoder and Hall inputs are provided per axis and two absolute encoders are supported. The product has four MARK inputs and one PEG output. One serial synchronous SPI type high speed receiver is available.

The UDMSD has cross axis synchronization. All drives within the product are highly synchronized, and further synchronization to network-neighboring axes is achieved by a network-wide distributed clock with better than 0.1 microsecond accuracy. The control algorithms are executed at a 20 kHz rate. The product supports 1kHz or 2 kHz EtherCAT cycle rates.

2. Operation

2.1 Operating UDMSD in an ACS Network

The UDMSD operates as a network element in an ACS EtherCAT network. A minimal network consists of an ACS master and an UDMSD. In this configuration a single CAT5e cable is connected from the master's EtherCAT Out port to the UDMSD EtherCAT In port. Host connection for configuration and control purposes connects from the host computer to the network master only. See Figure 13-1 for more details.

For any network configuration, a specific setup has to be provided. The setup is configured by using the MMI Application Studio configuration modules EtherCAT Configurator and System Configuration Wizard. See the SPiiPlus MMI Application Studio User Guide for more details.

For out of box operation, follow the instructions detailed below, referring to the detailed information provided in this manual and to the referenced ACS documents. Product operation depends on ordered features.

2.2 Setting Up a Network Master (Purchased Separately)

1. Establish communication with the master by using New SPiiPlus MMI Application Studio and SPiiPlus User Mode Driver, using either Ethernet or serial interface. Refer to SPiiPlus Setup guide for details.
2. Setup of EtherCAT network: use the SPiiPlus MMI Application Studio EtherCAT Configurator module to define the network according to ordered elements and needed network configuration. Refer to the SPiiPlus MMI Application Studio User Guide for details.
3. Configure the network elements, axes, and IOs: use the SPiiPlus MMI Application Studio System Configuration Wizard module to configure all network elements, numbering and configuration. Refer to the SPiiPlus MMI Application Studio User Guide for details.

2.3 Setting Up UDMSD

UDMSD set up consists of the following stages:

Please, read the safety instruction in Section 15 and closely adhere to them.

1. Prior to applying power, connect supply and control cables (refer to Section 3) using pre-wired cables. For cables' pin out and connector details refer to Section 19.
2. Using this HW guide, apply control and drive supply power, and setup an ACS network according to the instruction above.
3. UDMSD operation and programming: refer to the ACSPL+ Programmer’s Guide, and the SPiiPlus Command & Variable Reference Guide.

3. Product Interfaces

The following figure Figure 3-1 is a connection schematic for the UDMSD.

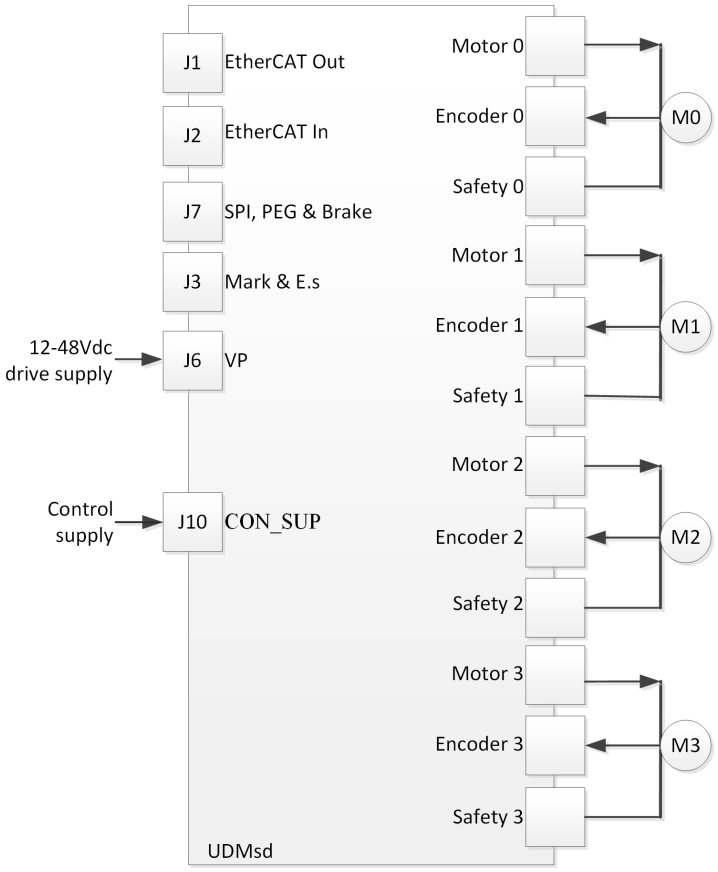


Figure 3-1. UDMSD Connection Schematic

3.1 Motor Types and Connections

The built-in universal drives support two and three-phase AC brushless (BL) synchronous, two and three-phase step, and DC brush motors. Selection of motor and parameter setting is done using the Adjuster Wizard of the SPiiPlus MMI Application Studio (refer to SPiiPlus MMI Application Studio User Guide).

A three-phase motor connection is depicted in Figure 3-2.

Motor cable lengths should not exceed three meters. A shielded cable should be used, terminated in the EGND pin of the motor connector, which is internally connected to the chassis (PE). If needed, the shield/GND may be connected to the motor's chassis to provide a seamless common ground reference.

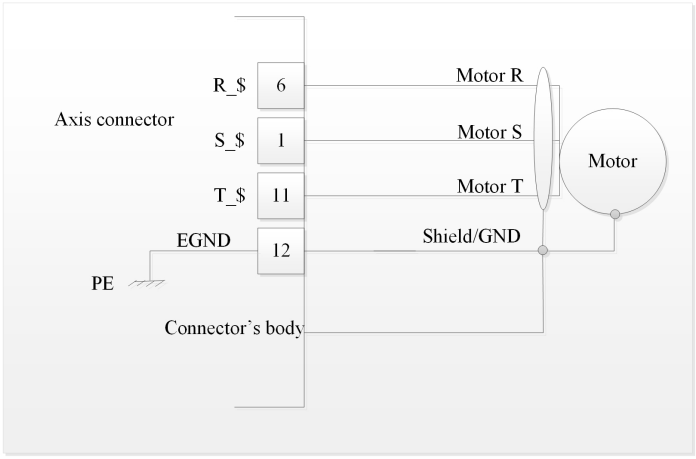


Figure 3-2. 3-Phase BL Motor Connection

For DC brush motor connections do not connect phase T as described in Figure 3-3:

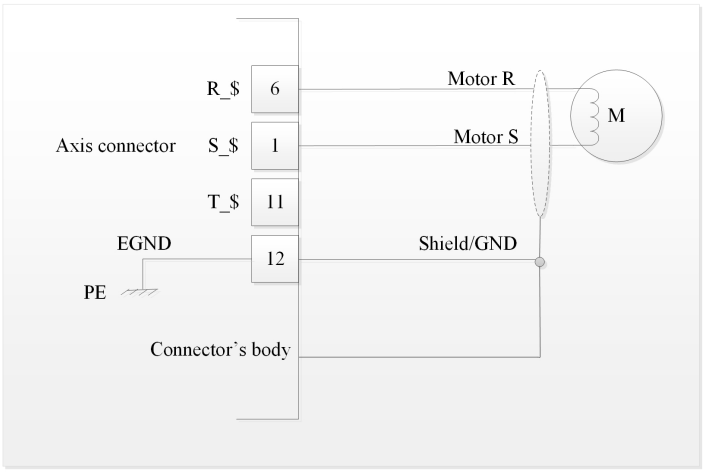


Figure 3-3. DC Brush Motor Connection

For two-phase step motors connect the motor phases between S-R and between T-R as shown in Figure 3-4.

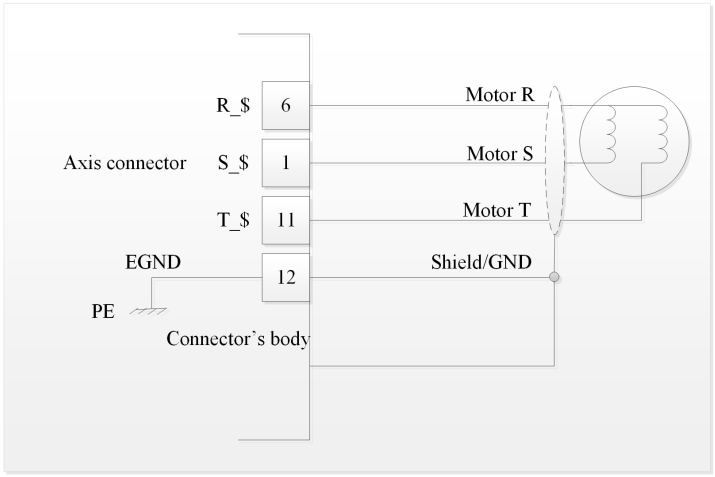


Figure 3-4. 2-Phase Step Motor Connection

4. Interfacing Motors

For motor cables use shielded (meshwork of tinned copper wire with high optical covering), high voltage withstand and very low capacitance cables. ACS specifies and tests this product using motor cable lengths of three meters. Motor cables should be routed as far as possible from sensitive-signal carrying cables such as encoder cables. Encoder cables should be selected according to manufacturer's recommendation. The motor cables' shield should be connected to specified pin of the motor connector: refer to connectors' pin-out in subsequent paragraphs and to Figure 3-2, Figure 3-3, and Figure 3-4 above.

5. Regeneration and Over Voltage

The application must ensure that under no conditions does the drive supply exceed 52Vdcas this can damage the product's power stage. The nominal drive supply supported is 12Vdc to 48Vdc.

In order to absorb excess mechanical reverse energy translated into electrical energy during deceleration, and to avoid a voltage rise beyond the drive's damaging overvoltage condition, an external active regeneration device should be used, connected in parallel to the drive supply inputs, and set to trip at 52Vdc.

5.1 Mechanical Motor Braking

A total of two control interfaces are provided, each supplying 0.5A. The interface is fed by external 24V supply applied to J7. The control circuit is opto-isolated, and protected against shorts. Refer to Figure 5-1 for a schematic description. The outputs can be programmed to be used as General Purpose outputs (refer to the ACSPL+ Programmers guide).

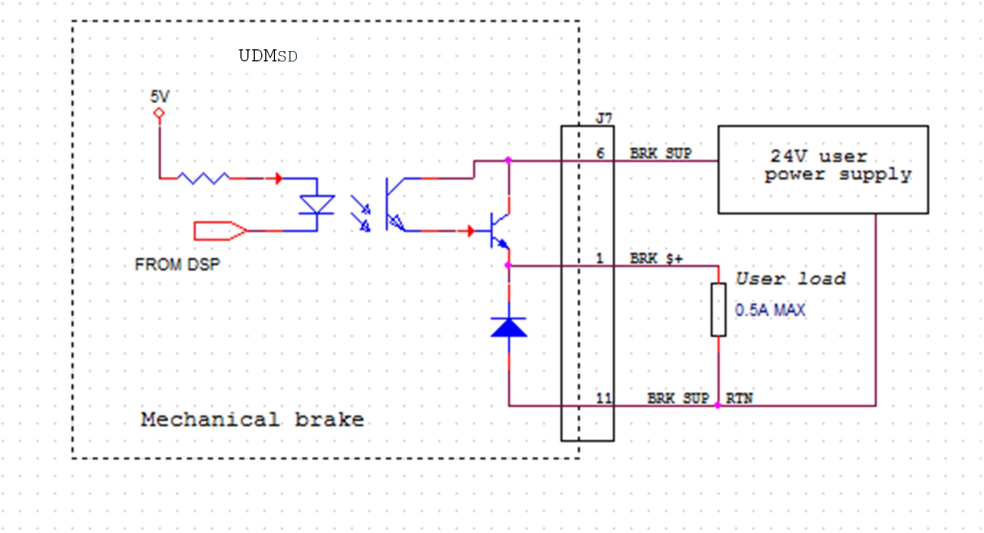


Figure 5-1. Mechanical Brake

6. Feedback

The UDMSD supports multiple feedback types:

- One incremental digital per axis (either a differential or single-ended which is software command selectable)
- Hall sensors (one set per axis)
- Up to 2 absolute encoders (axes 0(X) and 1(A))

For the supported absolute encoders, see Section 6.4. The type of absolute encoder has to be specified upon order, and cannot be modified at field level. Up to 1A at 5V is available as encoder power feed.

Certain constraints result from sharing internal resources and connector pins. Refer to detailed data for the UDMSD is provided below.

Note: The axes below have the following number-to-letter translation: 0-X, 1-Y, 2-A, 3-B.

UDMSD (2 axes product) of 1.25/2.5A and 2.5/5A is offered with the following configurations: 2 or 4 incremental encoders and 0, 1 or 2 absolute encoders of same type.

6.1 Dual Feedback (Dual Loop) Scheme

Dual feedback (dual loop) topology per axis is supported at the expense of number of the total network axes. The number of utilized network axes equals the number of digital encoders used. For example, when a dual feedback scheme is implemented for an axis, 2 network axes are consumed out of the total number of network axes supported for the specific master controller.

For 1.25/2.5A and 2.5/5A versions, the secondary encoder for axis 0(X) is that of 2(A), and for axis 1(Y) is that of 3(B). A total of 2 dual-loop setups are supported. An absolute encoder can be used as the primary axis for axis 0(X) and 1(Y).

Refer to available configurations for dual loop schemes below.

6.2 Axis and Encoder Numbering and Assignments

Use the table below for axes and encoder configurations for single loop and for dual loop applications.

Table 6-1. Encoder Configurations

1.25/2.5A 2.5/5A		Prime encoder	Secondary encoder	1.25/2.5A 2.5/5A
Axis	**Encoder deployment**	**Digital Incremental**	**Absolute**	**Digital Incremental**
0(X)	Single loop	0(X)		
0(X)	Single loop		0(X)	
0(X)	Dual loop	0(X)		2(A)
0(X)	Dual loop		0(X)	2(A)
1(Y)	Single loop	1(Y)		
1(Y)	Single loop		1(Y)	
1(Y)	Dual loop	1(Y)		3(B)
1(Y)	Dual loop		1(Y)	3(B)
2(A)	Single loop	2(A)		
3(B)	Single loop	3(B)		

6.3 Incremental Digital AqB Encoder

Each internal drive supports one incremental digital AqB encoder. The interface of each of the encoder's A, B and Index signal is depicted below.

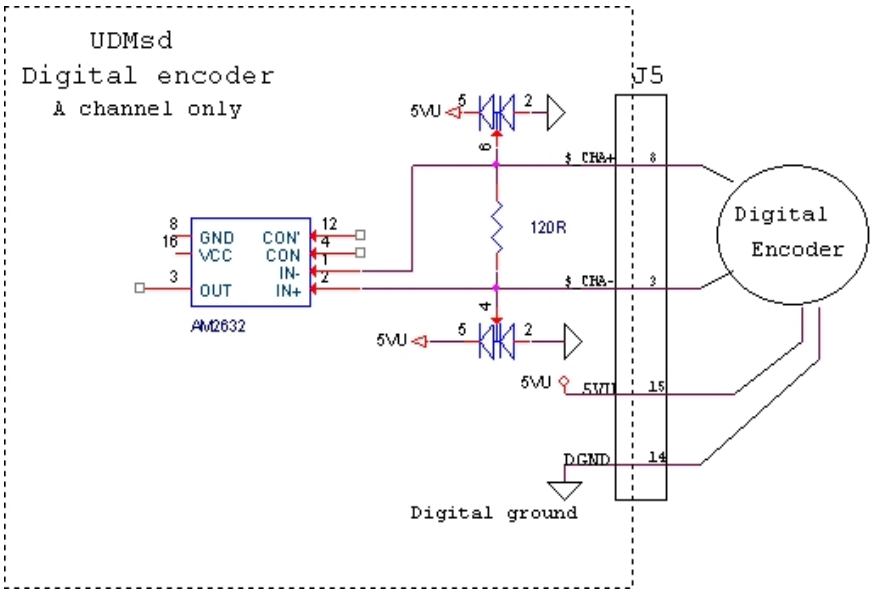


Figure 6-1. Incremental Digital AqB Encoder Connections

The interface is a protected RS-422 differential line with 120Ω termination.

- Maximum rate: 12.5MHz which equals 50 million Quadrature counts/sec.
- Faults detected: Encoder error, and encoder disconnection
- Selection of differential and single-ended interface (ETYPE=2): by software command. Note that when single-ended encoder is selected, "encoder not connected" indication (and therefore protection) are inactive. A shielded, short as possible cable should be used, in order to reduce noise pickup

Encoders are fed by a 5V±5% 1A supply (the total available current to all encoders) referenced to a digital ground.

A, B, I and Clk/Dir modes of operation are supported.

6.4 Absolute Encoder Support

Endat2.2, Tamagawa SmartABS, Panasonic and BiSS-C encoders are supported. You must check with ACS regarding availability and specific encoder support. The supported encoder type is factory preset according to your order.

6.5 Position Event Generation (PEG) for Axis 0

The UDMSD supports one advanced position dependent PEG output signal (referred to also as Output Compare) for synchronous random and incremental timing generation. The PEG pulse is assigned to axis 0(X) encoder, and can be programmed for polarity and shape.

The Incremental PEG mode provides the ability to generate a fixed width pulse, starting and ending at pre-programmed points.

The Random PEG mode provides the ability to control a PEG pulse at pre-defined positions, which are stored as a 256 member user-defined array. The signal can be used as a General Purpose output.

Refer to the PEG and MARK Operations Application Notes for more details.

7. Power Supplies

The UDMSD is fed by two supply sources: Control Supply (referred to as CONTROL SUPPLY on front panel) to the logic and control circuitry and a 12Vdc to 48Vdc supply to the motors (referred to as DRIVE SUPPLY on front panel). In addition, dedicated supply pins are assigned for motor braking and for limit safety inputs.

Control DC supply - Maximal consumption of 15W (<1A), 24Vdc±20%.

Mechanical braking supply Maximum of 0.5A per axis (24V±20%, opto isolated, source) is provided for motor mechanical brake activation. The brake supply is fed through dedicated pins in J7.

Drive supply 12Vdc to 48Vdc. Maximum current 8A continuous. Peak current for 1 second is 16A.

Maximal continuous/peak input currents as functions of maximal continuous and peak Output power is presented in Table 7-1.

Plugging the 48V supply cable while the supply is on will damage the unit. The power cord must be connected when the supply is off.

Table 7-1. Output Power vs. Input Current and Drive voltage

	Motor output current (cont/peak per axis)	Motor output current (cont/peak per axis, Arms)	Maximum input current for 4 axes. Arms	Output power (cont/peak, per axis)	Total output power for 4 axes (cont/peak)
1.25/2.5A version	1.25/ 2.5A	0.9/ 1.8	4.3	50/96	200/384
2.5/5A version	2.5/ 5A	1.8/ 3.6	8.6	98/193	392/772

8. HALL Sensors

One HALL sensor set per drive is optionally available. Each consists of a set of three single ended, opto isolated interfaces, with 7mA maximal current, source input type signals. The connection for a HALL sensor is shown in Figure 8-1.

The Hall sensor input signals share the same pins as the Right and Left limit inputs. A UDMSD is set at the factory to support either Hall sensor or Right and Left limit inputs.

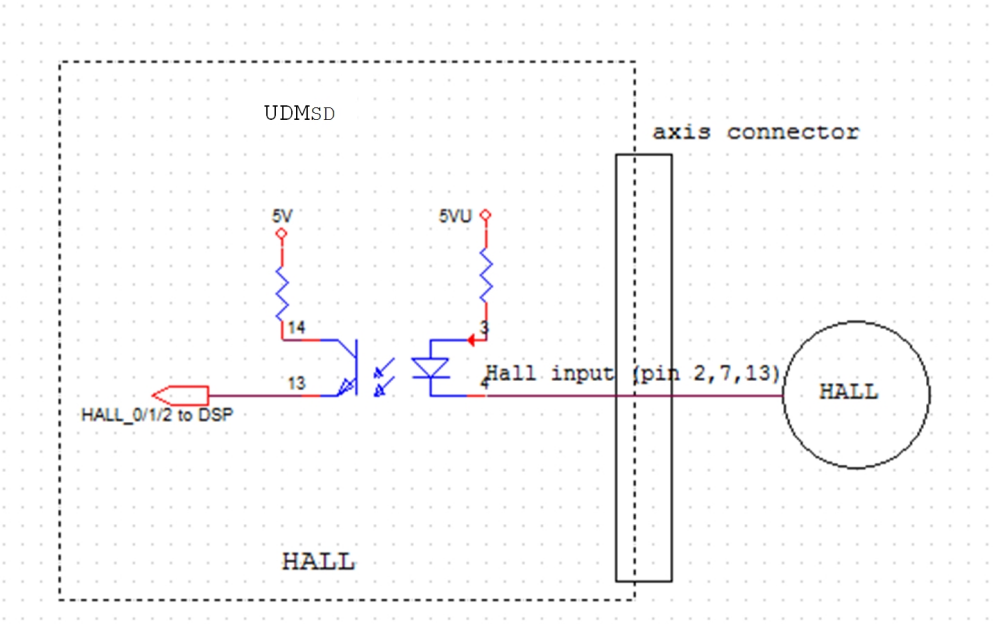


Figure 8-1. HALL Sensor Connection

9. Registration MARK Inputs

Four, Fast, 5V/12V/24V±20%, SINK, opto-isolated,singl-ended mark inputs are available.

Maximum input current is 20mA.

The signals can be used as general purpose fast inputs.

The opto-isolated MARK inputs have a propagation delay of up to 200ns. For MARK and GP Input assignment refer to the *SPiiPlus Command & Variable Reference Guide*.

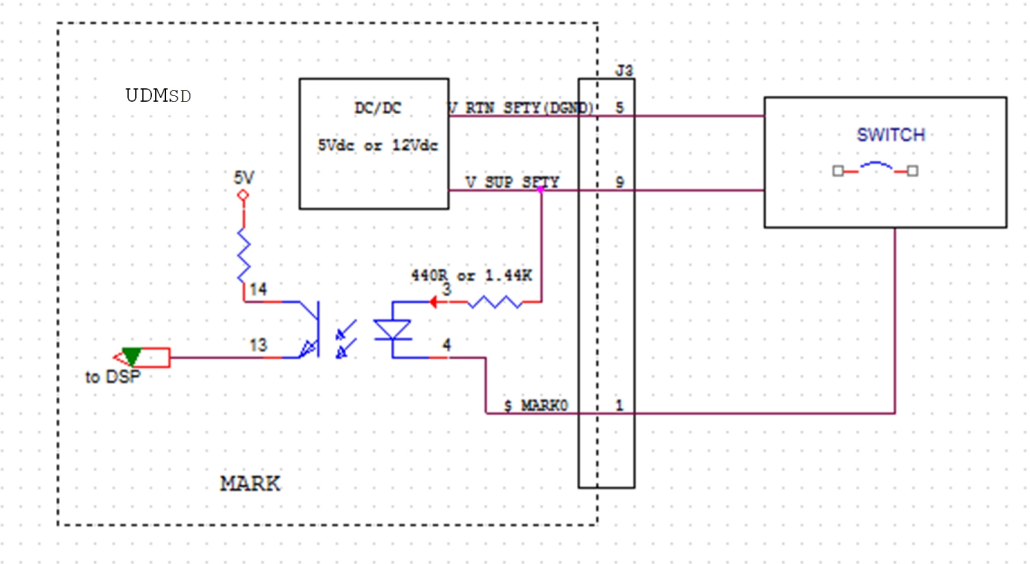


Figure 9-1. MARK inputs

10. Emergency Stop

One Emergency Stop input is available. It is a two line, opto-isolated signal, fed from a user-provided 24V supply and activated at above 14mA, as depicted in Figure 10-1. 'No current' is defined as the default inactive state of switch.

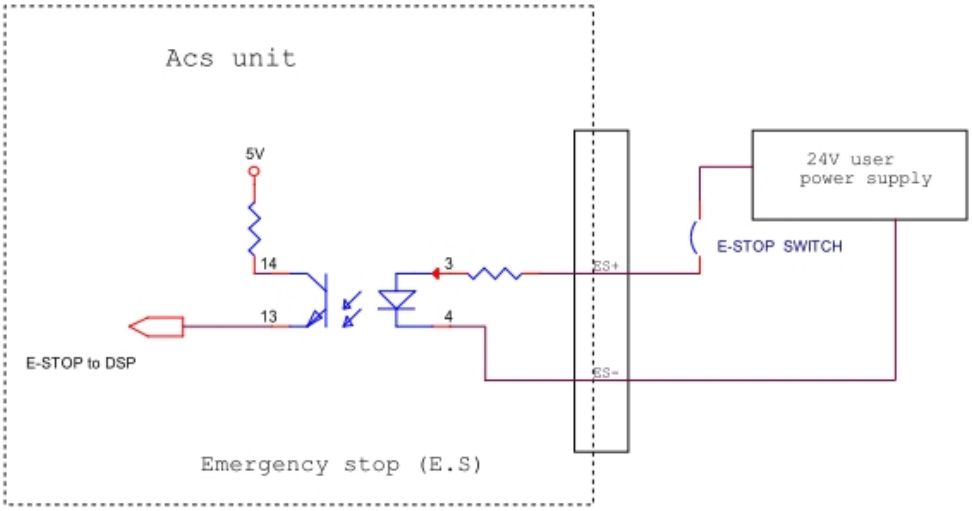


Figure 10-1. Emergency Stop Input

11. Right and Left Limits

Right Limit and Left Limit inputs per axis are provided. The limit connections are shown in Figure 11-1.

The Right and Left input signals share the same pins with the Hall sensor inputs. The Right and Left limit inputs are the default configuration. Hall sensor inputs are an option. A UDMSD is set at the factory to support either Hall sensor or Right and Left limit inputs.

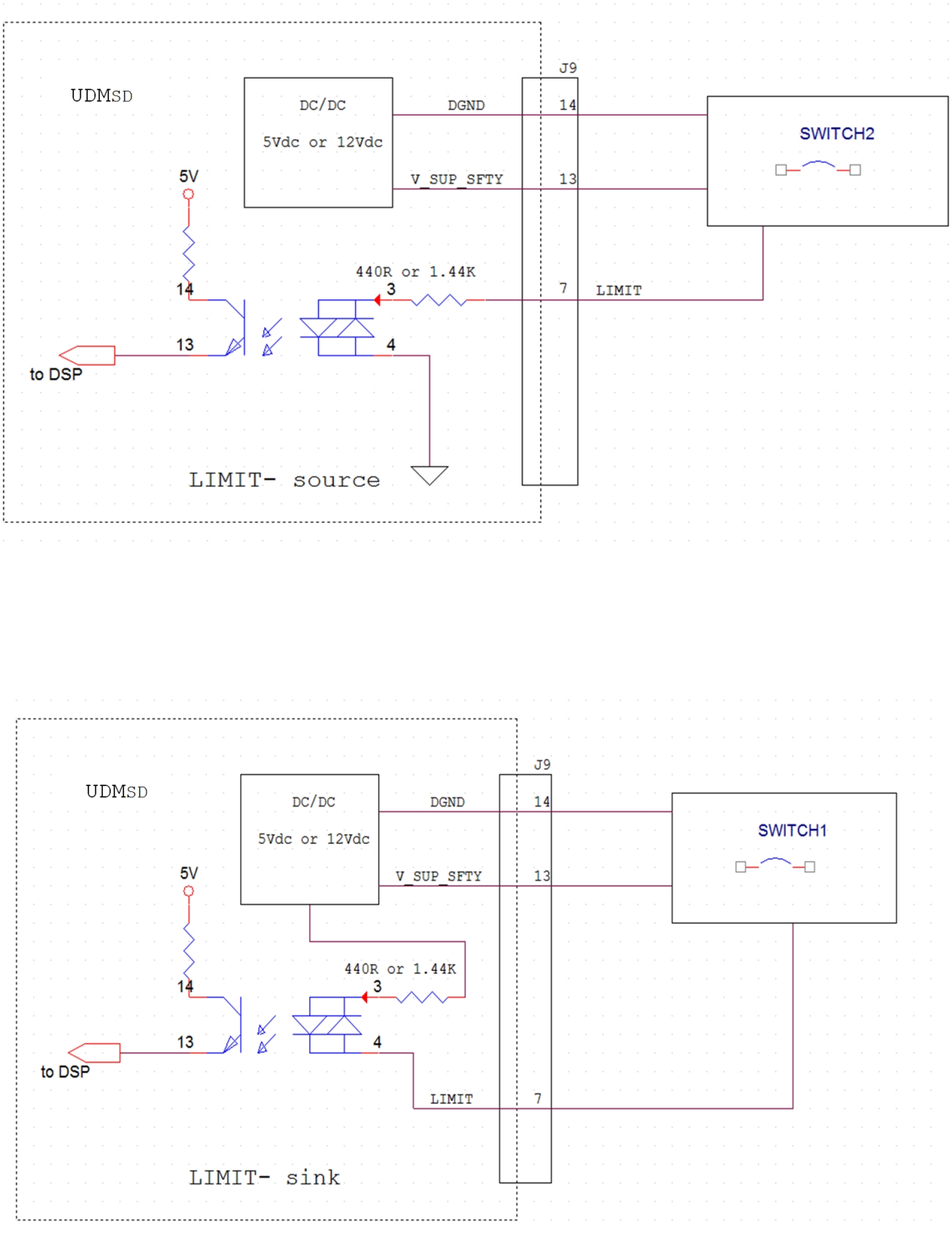


Figure 11-1. R/L Limit Connections

The inputs are single-ended, fed by a 5V/12V/24V±20%, opto isolated, sink/source, referenced to DGND. The input current is limited to 14mA, with an internal resistor is 5.6kΩ. 'No current' is defined as the default inactive state of switch. The supply voltage and the sink or source are factory setting.

12. Fault Indications

The UDMSD supports hardware and software based fault indications (measured per axis and reported by software) for:

- Over voltage at 55Vdc ±3% reported by software
- Over Temperature at 100deg C, reported by software
- Motor Phase faults: Phase-to-Phase Short and Short-to-Ground, reported by software
- Over Current

12.1 LED Indicators

The Table Table 12-1 below summarizes the meaning of theUDMSD LED indicators.

Table 12-1. UDMSD LED Indicators

Indication	Description
Control Supply (on EtherCAT Out connector)	Yellow, when on – power is applied
Link/Activity (on EtherCAT In and Out connector)	Green • Off – No link • On – Link exists, no data transferred • Blinking – Data being transferred
Run (on EtherCAT In connector)	Yellow. Reflects EtherCAT link state • Off – INIT State • Blinking (slow) – PRE-OPERATIONAL state • On – OPERATIONAL state • Flickering (fast) - BOOTSTRAP state
System (on panel)	Bicolor. • Red – System Fault (communication lost with master, loss of synchronization etc.) • Green – System OK • Blinking –software command

13. Communication

13.1 Network (EtherCAT®) Communication

As an EtherCAT network element ("slave"), the UDMSD has EtherCAT IN and EtherCAT OUT ports, for connection with the product's neighboring network devices. UDMSD can be the first device connected to the master or can be located in any other position in the network. Refer to Figure 13-1 for a schematic connectivity diagram depicting two sample configurations: in the upper diagram, UDMSD is connected to an ACS master which in turn is connected to a host computer. In the lower diagram, UDMSD is connected to SPiiPlusSC, which combines an EtherCAT master functionality, host application and ACS motion controller.

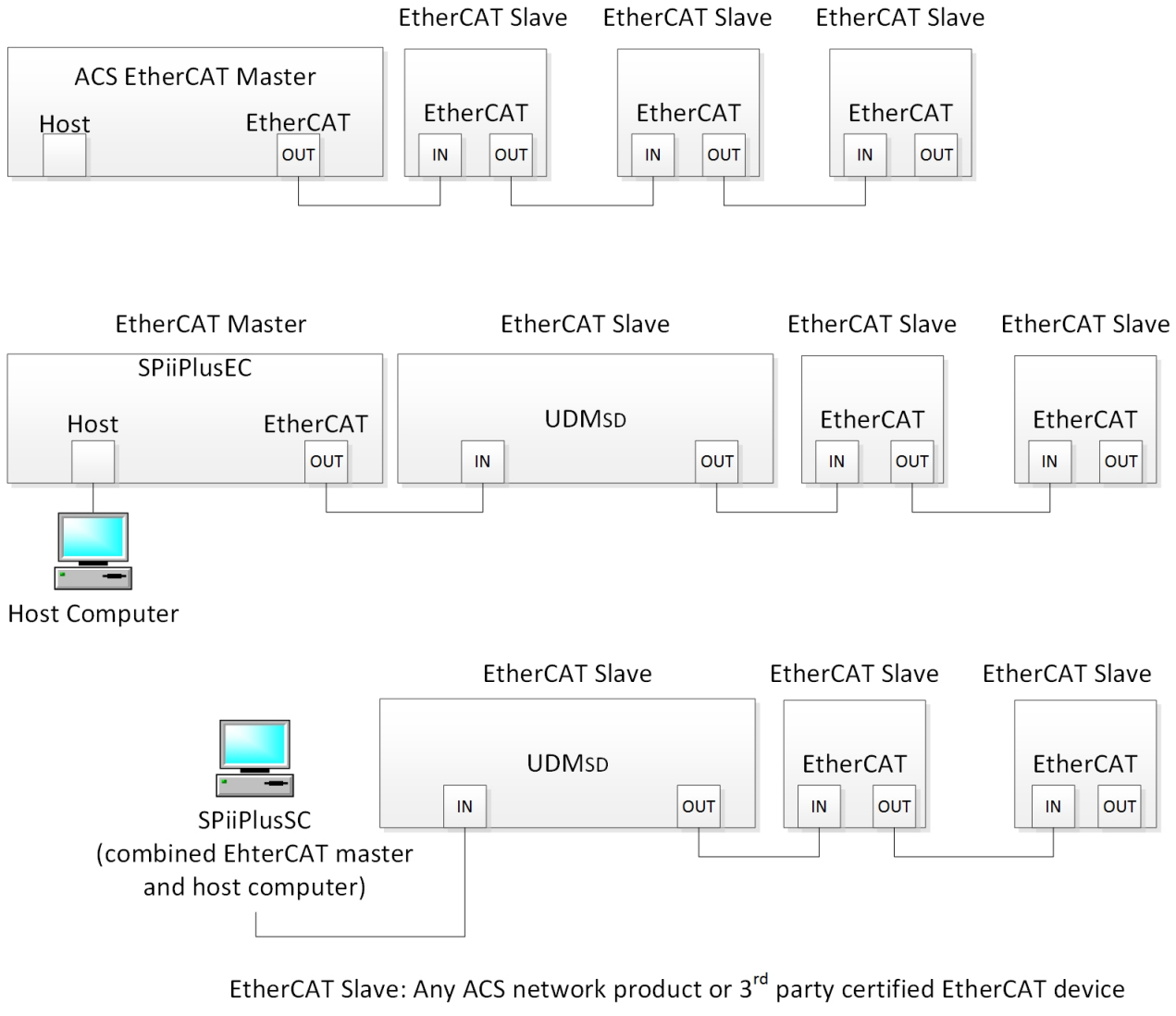


Figure 13-1. EtherCAT Network Connections

Cable type – use CAT5e or other high quality cables. ACS provides such cables at varying lengths of 30 cm to 50 m.

EtherCAT cable lengths – all ACS products have been tested with 50 m cables between adjacent nodes. At lengths of up to 100 m one should carefully test performance as function of network complexity and operating environment.

When employing the SPiiPlus UDMSD in an EtherCAT network, the SPiiPlus MMI Application Studio EtherCAT Configurator tool is used for system configuration (refer to the SPiiPlus MMI Application Studio User Guide for details).

14. Thermal Considerations

The rated range for operation of the UDMSD is ambient temperatures from 0°C to 50°C. In order to determine whether air flow is needed as function of the output power and ambient temperature, use Charts A and B below in the following way:

- Calculate the total heat dissipation of all axes used by summing the heat dissipation per axis from chart A.
- As function of the ambient temperature and the calculated dissipation above, determine whether forced 10CFM air flow is needed.

The air flow should be applied through the ventilation openings of the unit when the RJ45 EtherCAT connectors are facing upwards, vertically upwards.

Although the product is designed to work with no forced air at maximum power, 10 CFM of air flow is needed under the following conditions:

- The ambient temperature is more than 22°C at maximum output power or
- Tthe ambient temperature is greater than 40°C and at 50% maximum output power

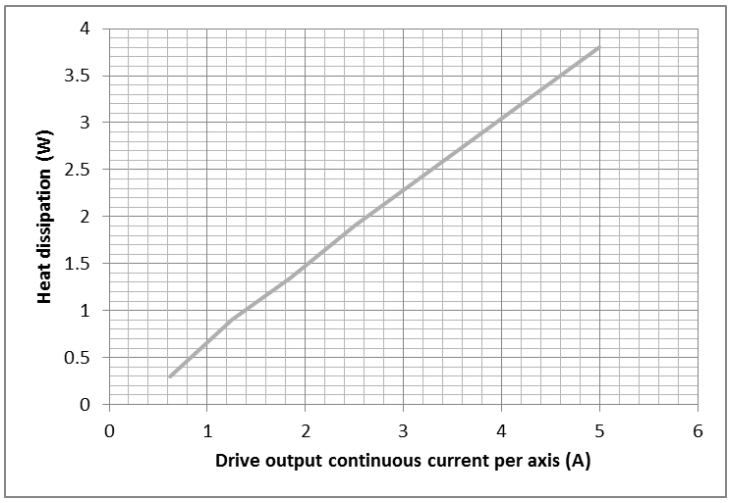


Figure 14-1. Thermal Considerations Chart A

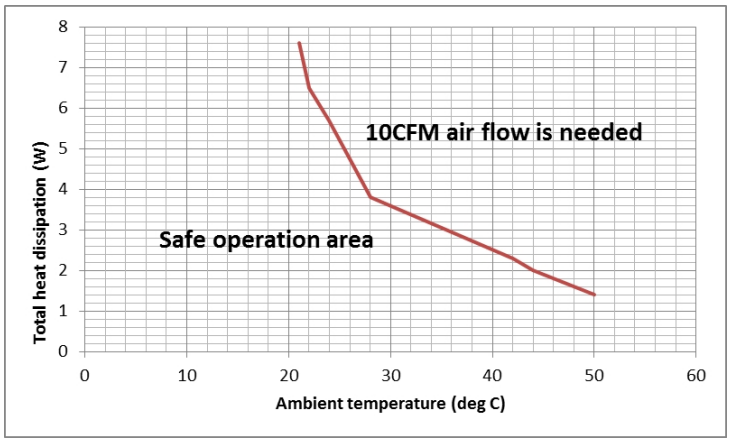


Figure 14-2. Thermal Considerations Chart B

15. Personnel Safety Guidelines

Make sure that the following guidelines and procedures are addressed and observed prior to powering, and while handling any of the network elements. Observing these procedures is crucial in order to achieve safe and optimal operation of ACS networking provisions.

Installation and maintenance must be performed by qualified personnel only. Such a person must be trained and certified to install and maintain high power electrical and electro-mechanical equipment, servo systems, power conversion equipment and distributed networks. Prior to powering up the system, ensure that all network components are properly installed mechanically, properly grounded and that all attached power and signal cables are in good operating conditions. Maintenance should be performed only after the relevant network element has been powered down, and all associated and surrounding moving parts have settled in their safe mode of operation. Certain drives require longer times in order to fully discharge.

Follow the hardware guide of each element and observe the residual discharge time specified. Avoid contact with electrostatic-sensitive components and take the required precautions.

The UDMSD is powered up as long as a live power inlet is connected to it. Therefore it is the responsibility of the user to provide an in-series switch or circuit breaker that disconnects all power-carrying signals which is readily and rapidly accessible to the operator. The disconnecting device must meet the requirements of IEC60947-1 or IEC60947-3. A 10A maximal rating of the circuit breaker is recommended.

Power supply should allow the circuit breaker to be activated at the product's short circuit condition.

The disconnecting device must be in close proximity to the equipment and within easy reach of the operator, and be clearly marked as a disconnecting device.

16. Dimensions and Installation

16.1 External Dimensions

The following figure Figure 16-1 show the external dimensions for the UDMSD.

Length: 120mm

Width: 100mm

Height: 48mm (including panel connectors).

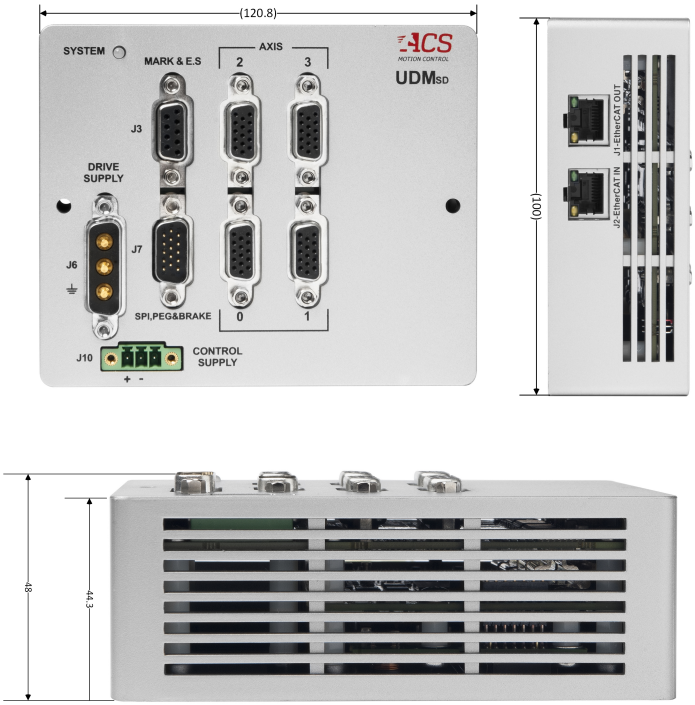


Figure 16-1. External Dimensions

16.2 Installation

The UDMSD can be panel or DIN rail mounted.

Panel mounting: Use two long screws of M4X50 mm type, as shown in Figure 16-2.

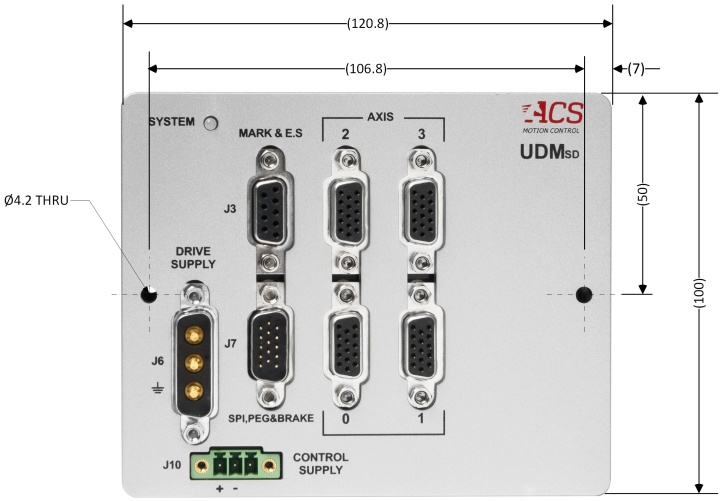


Figure 16-2. Retaining Screw Locations

DIN rail mounting: A DIN rail adaptor is part of the ordered UDMsd-ACC accessory kit. See Figure 16-3 for mounting details and dimensions.

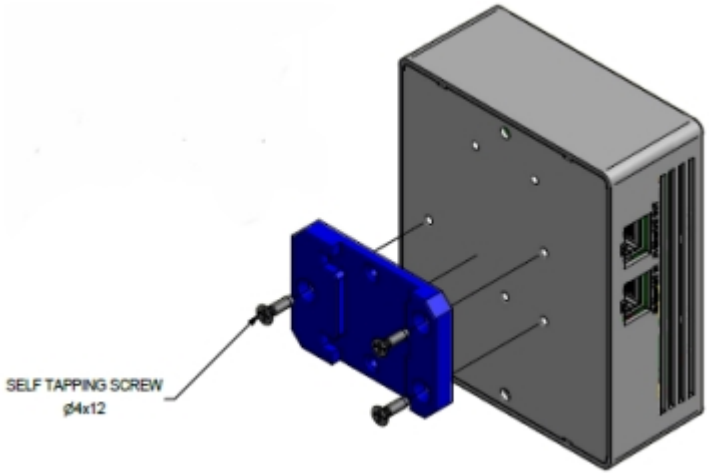
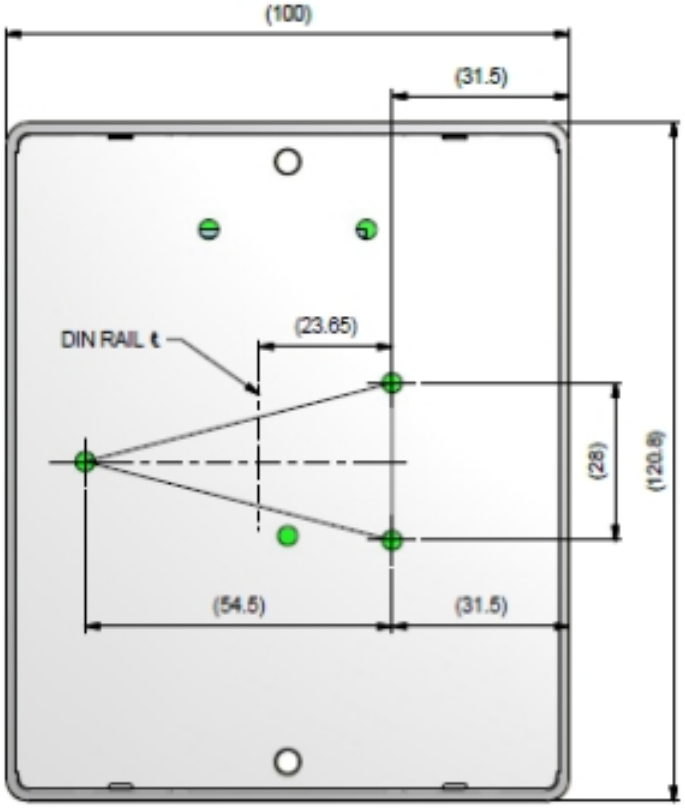
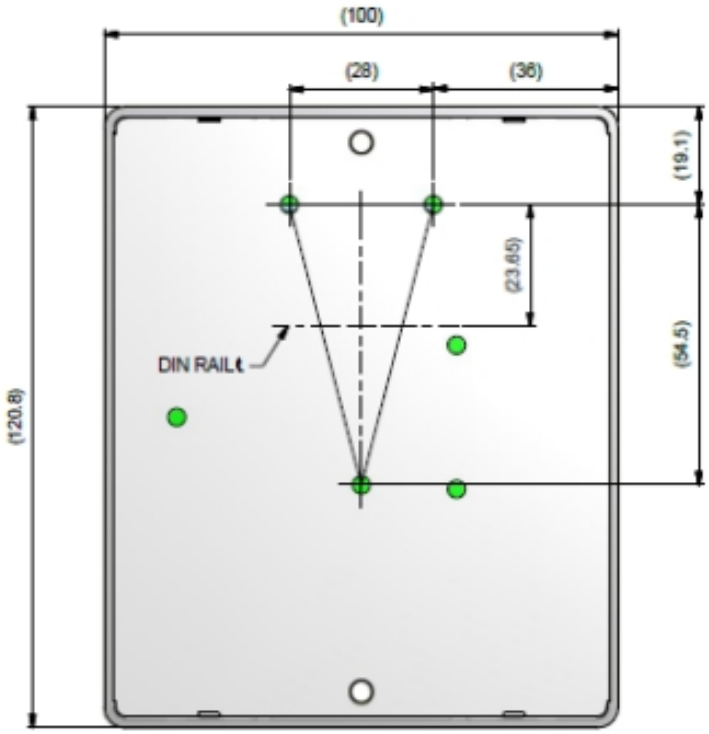


Figure 16-3. DIN rail mounting





Grounding screw: When installing the UDMSD, an Earth ground must be connected to PE pin in connector J6.

16.3 Accessory Kits

Ordering options for accessories:

UDMsd-ACC1	Mating connectors' set
UDMsd-ACC2	DIN-rail mounting kit
UDMsd-ACC3	Mating connectors with 1.5m cables with flying leads

17. Grounding and Shielding

Figure 17-1 depicts the recommended scheme for shielding and motor cable connections.

Note that the motors' and encoder's shield is connected to the EGND (PE) internal line.

The digital ground (DGND) is shortened internally to Vp[-] line. In order to reduce system noise, the user may elect to connect this common signal of Vp[-] and DGND to the EGND(PE) externally, by shortening pins 2 and 3 in the J6 connector, as depicted in Figure 17-1 below by the dashed line. It should be noted that for safety standardization testing mandate to have a separation between these signals.

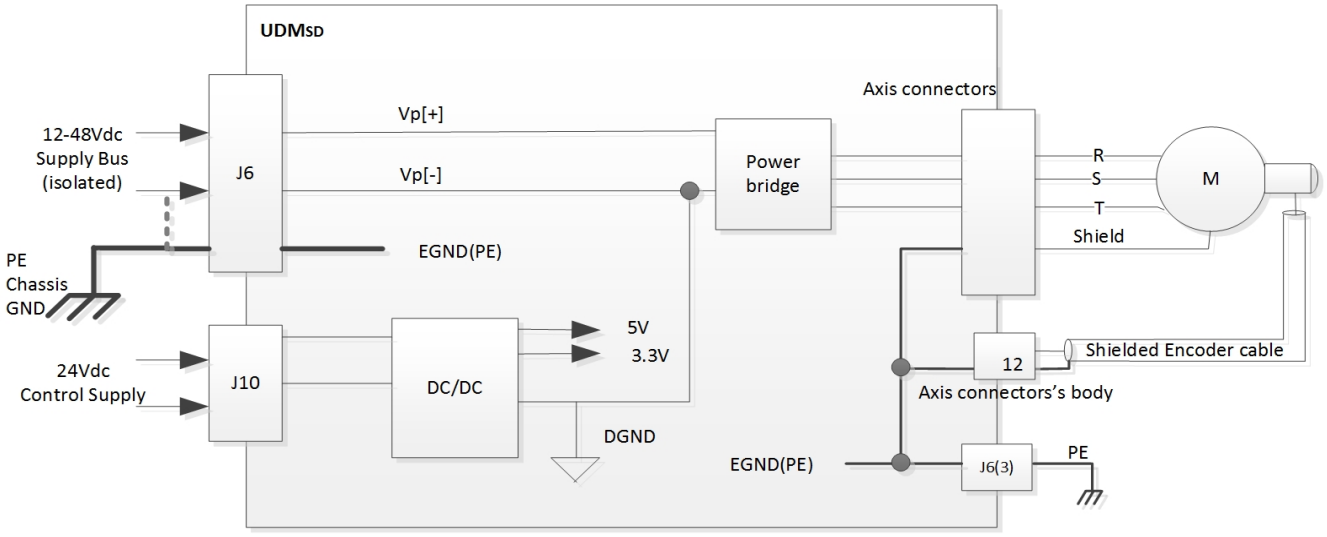


Figure 17-1. Grounding and Shielding

18. UDMSD Specifications

This section presents the specifications for the UDMSD product line.

18.1 General

Number of internal axes	2, 4
Supported control schemes	Single and Dual loop control schemes. Gantry.
Available options and configurations	Ordering options: number of axes, current rating, number of digital encoders, number of absolute encoders.
Weight	304 grams

18.2 Input Power

Control DC supply (CON_SUP)	24Vdc±20%. Maximum input power: 15Watt. Input current: <1A No need to remove the control supply during emergency conditions.
Drive supply	12-48Vdc. Maximum current 8A continuous. Peak current for 1 second is 16A.
Mechanical brake supply	24Vdc 2A to support 0.5A per axis.

18.3 Drives

Control	Type: digital current control with field-oriented control and space vector modulation. Current ripple frequency: 40 kHz Current loop sampling rate: 20 kHz Programmable Current loop bandwidth 5 kHz. Commutation type: sinusoidal. Initiation with and without hall sensors. Switching method: advanced unipolar PWM. Maximal drive output voltage (phase to phase) @ nominal current, sine amplitude: Vbus x 93% (Vdc)
Protection	Software fault reporting on: Over voltage, Motor Phase-to-phase short circuit, motor phase to ground short circuit, Over-current, Over-temperature
Motor types	two- and three-phase permanent magnet synchronous two- and three-phase step (micro-stepping or servo) DC brush. Voice coil.
Motor cable lengths	3m

18.4 Communication

EtherCAT	• two ports for Node-to-node connectivity w/o redundancy. • One port for connection towards master (IN). • One port for connecting towards next slave away from master (Out). • 100 Mbit/sec. • Up to 100m between adjacent nodes using standard CAT5e cables. • Testing performed at 50m using ACS CAT5e cables.
RS-232 port	Unused, front panel connector only.

SPI	• Receiver only, synchronous serial communication of up to 12.5Mhz. • Interface signals: data input, Clock input and chip select.
HSSI port	None

18.5 Encoders

Incremental digital AqB	• Total of four, one per axis • Supports A&B, I and Clk/Dir modes of operation • Differential, RS422 compatible, or Single-end TTL level • Max. rate: 12.5MHz for A and B, equivalent to 50 million encoder counts/sec • Fault detection: Encoder error and encoder not connected. • Encoders are fed by a 5V±5% supply (total available current to all encoders – 1A).
HALL	• Total of four, a set of three per axis • Single-ended, 5V, source, opto-isolated • Share same pins with Limit input • Input current: <7mA • Consists of HA, HB, and HC lines per axis • Default product does not include HALL

Absolute position	• Total of two. Certain assignment constrains, as function of axes and production configuration, apply
	• Interface - Differential RS485
	• 5.1-5.25V, 1A total for all encoders
	• Availability - optional
	• Supported types:
	  ■ EnDat2.2, Heidenhain, based on ROQ 437 SERIES (2.5 MHz)
	  ■ Smart-Abs: Tamagawa, based on: SA35-17/33bit-LSP-5V (2.5 MHz)
	  ■ BiSS-C (10 MHz)
	  ■ SSI (10 MHz)
	  ■ Panasonic: based on AC Servo Motor MINAS A4 Series (2.5 MHz)

18.6 Registration MARK input

Registration MARK Inputs	• Four, Fast, 5V/12V/24V±20%, SINK, opto-isolated, Single-ended , Reference to DGND • 10mA maximum input current The signals can be used as general purpose fast inputs, as function of software configuration

18.7 Mechanical brake

Mechanical Brake	• Two total outputs. 24V ±20%, opto-isolated current driving signals, source type, 0.5A each. • Protection against short circuit is provided.

18.8 PEG Outputs

Dedicated PEG Signal	One (assigned to axis 0(X)) pulse for incremental or random mode, differential RS-422 output. For further information on PEG operation, see the *PEG and MARK Operations Application Notes*.

18.9 Safety and Faults

Limits	• Right Limit and Left Limit per axis. • Single-ended, 5V/12V/24V±20%, opto isolated, sink/source. • Reference to DGND. • Maximal input current is 14mA.
Emergency Stop	• One opto-isolated, 24V, 2-teminal signal. • Maximal input current is 14mA. • 'No current' is defined as the default inactive state of switch.
Over temperature	• Over-Temperature condition occurs at ~100ºc (as measured on the product's PCB). • All of product's drives are disabled on this condition. • Software indication to user's application is provided.
Over current	• Short and Over current: 7.4A±5% (per axis) for 1.25/2.5/5A. • Specific drive with short/over current disabled on this condition. • Software indication to user's application is provided .
Drive supply over voltage	• Over voltage: 55V±3% . • All drives disabled on this condition. • Software indication to user's application is provided .

18.10 Environment

Temperature during operation	0°C to + 50°C. See Section 14.
Storage	-25°C to +70°C
Humidity	5% to 90% non-condensing

18.11 Applicable Standards

The UDMSD Dual Axis Control Module meets the requirements of the following standards:

EN 61326-1:2006	Industrial locations equipment, class A standard, under article 6(2) of EMC Directive 2004/108/EC (ACSEMC_EN.22513C)
IEC 61010-1:2001	Safety conformance, 2nd edition.
IEC 60068-2-6 Class 4M4 IEC 60068-2-29 Class 4M4 IEC 60068-2-56 Class 4K3	Sine vibration during operation (5-150 Hz, 3 axes, 10 m/s^2) 600 shocks, 150m/s2, 6ms 93%, 30C

19. UDMSD Connectors

The following Figure Figure 19-1 shows the connectors on the UDMSD.

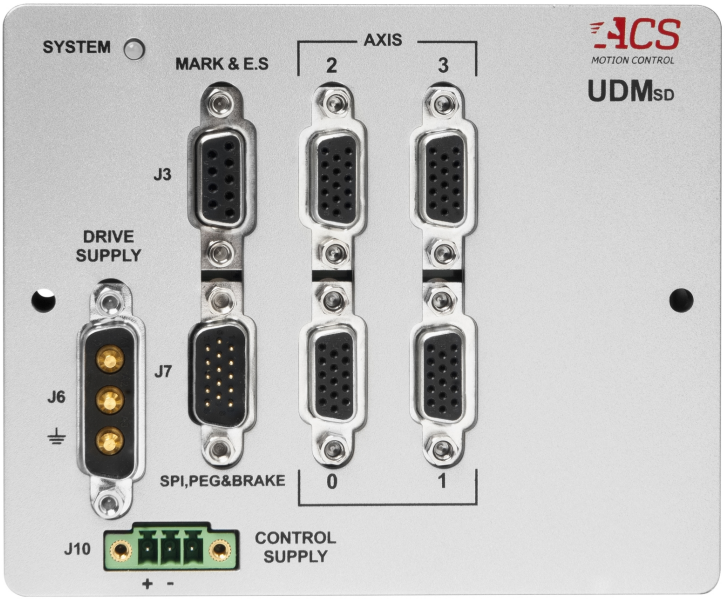


Figure 19-1. UDMSD Connectors

19.1 J1 – EtherCAT Output Connector

The following Figure Figure 19-2 shows the location of the LED indicators on the UDMSD.

Figure 19-2. Location of LED Indicators

Label: J1 EtherCAT Out

Connector Type: RJ45

Mating Type: Ethernet plug

Table 19-1. J1 Connector Pinout

Pin	Name	Description
1	TD+	Positive transmit signal
2	TD-	Negative transmit signal
3	RD+	Positive receive signal
4	N/C	Not connected
5	N/C	Not connected
6	RD-	Negative receive signal
7	N/C	Not connected
8	N/C	Not connected

19.2 J2 – EtherCAT Input Connector

See Figure Figure 19-2 for the location of the LED indicators on the UDMSD.

Label: J2 - EtherCAT In

Connector Type: RJ45

Mating type: Mating Type

Table 19-2. J2 Connector Pinout

Pin	Name	Description
1	TD+	Positive transmit signal
2	TD-	Negative transmit signal
3	RD+	Positive receive signal
4	N/C	Not connected
5	N/C	Not connected
6	RD-	Negative receive signal
7	N/C	Not connected
8	N/C	Not connected

19.3 J3 – MARK & E.S

Label: J3 – MARK & E.S

Connector Type: D-type 9 pin female

Mating type: D-type 9 pin male

Table 19-3. J3 Connector Pinout

Pin	Name	Description
1	MARK0	MARK 0
2	MARK2	MARK 2

Table 19-3. J3 Connector Pinout (continued)

Pin	Name	Description
3	5VU	5V auxiliary supply (same encoder supply)
4	ES-	E-STOP inverted input
5	V_RTN_SFTY	Safety supply return, internally connected to DGND
6	MARK1	MARK 1
7	MARK3	MARK 3
8	ES+	E-STOP non inverted input
9	V_SUP_SFTY	Safety supply
	Shield	The body of the connector

19.4 J4, J5, J8, J9 – Axis Connectors

Label	Axis
J4	Axis 2
J5	Axis 3
J8	Axis 0
J9	Axis 1

Connector Type: D-type 15 pin high density female

Mating Type: D-type 15 pin high density male

Table 19-4. J4, J5, J8, J9 Connectors' Pinout

Pin	Name	Description
1	S	Motor S phase
2	$_RL/$_HB	Right limit or Hall phase B
3	$_CHA-	$ digital encoder, channel A inverted input, for differential encoder only. Absolute encoder Data-.
4	$_CHB-	$ digital encoder, channel B inverted input for differential encoder only. Absolute encoder CLK-.
5	$_CHI-	$ digital encoder, channel I (index) inverted input for differential encoder only.
6	R	Motor R phase
7	$_LL/$_HA	Left limit or Hall phase A
8	$_CHA+	$ digital encoder, channel A non-inverted input, used for both single-ended and differential encoders. Absolute encoder Data+.
9	$_CHB+	$ digital encoder, channel B non-inverted input, used for both single-ended and differential encoders Absolute encoder CLK+.
10	$_CHI+	$ digital encoder, channel I (index) non inverted input, used for both single-ended and differential encoders
11	T	Motor T phase
12	Shield	Shield
13	V_SUP_SFTY/$_HC	Safety supply, or Hall phase C

Table 19-4. J4, J5, J8, J9 Connectors' Pinout (continued)

Pin	Name	Description
14	DGND	Digital ground
15	5VU	5V for encoder supply
	Shield	The body of the connector.

19.5 J6 – Drive Supply

Label: J6 - Drive Supply

Connector Type: D-type 3W3 male

Mating type: D-type 3W3 female

Table 19-5. J6 Connector Pinout

Pin	Name	Description
1	VP+	12-48Vdc drive supply
2	VP_RTN	Drive supply return
3	EGND (PE)	Protected earth (shield)

19.6 J7 – BRAKE & PEG & SPI

Label: J7 – BRAKE & PEG & SPI

Connector Type: D-type 15 pin high density male

Mating type: D-type 15 pin high density female

Table 19-6. J7 Connectors Pinout

Pin	Name	Description
1	BRK0	BRAKE output 0
2	PEG0+	PEG 0 non inverted output
3	DATA_OUT_0-	Data out of SPI 0 inverter signal
4	SPI_CS_0-	Chip select of axis 0 inverted signal
5	DATA_IN_0-	Data in of SPI 0 inverter signal
6	BRK_SUP	24V brake supply positive
7	BRK1	BRAKE output 1
8	DATA_OUT_0+	Data out of SPI 0 non inverted signal
9	SPI_CS_0+	Chip select of axis 0 non inverted signal
10	DATA_IN_0+	Data in of SPI 0 non inverted signal
11	BRK_RTN	Brake supply return
12	PEG0-	PEG 0 inverted output
13	DGND	Digital ground
14	SPI_CLK_0+	Clock out of SPI 0 non inverted signal
15	SPI_CLK_0-	Clock out of SPI 0 inverted signal
	Shield	The body of the connector.

19.7 J10 – Control Supply

Label: J10 - Control Supply.

Connector Type: Phoenix p/n MC 1,5/ 3-GF-3,81 – 1827871

Mating type: Phoenix p/n MC 1,5/ 3-STF-3,81 - 1827716

Table 19-7. J10 Connector Pinout

Pin	Name	Description
1	24VDC	+24V dc control supply
2	24V_RTN	24V dc control supply return
3	Shield	The body of the connector

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